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GB 2208918 A

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(54) Abstract Title
Beverage dispense system

(57) A beverage dispense system has an ice bank cooler 4 and a thermoelectric cooler 5 for cooling beverage from a supply 2 to an outlet 1 to respective first and second temperatures. Both coolers are operable during the dispense to cool the beverage to a desired temperature. Either the thermoelectric or both coolers are switched off during the final part of the dispense so that when the outlet is closed a static volume of beverage remaining in the supply line between the thermoelectric cooler and the outlet has not been cooled to the second temperature and thus is prevented from freezing. The static volume is small compared to the dispensed volume. The final part of the dispense line may pass through a cooled water recirculation loop 11.

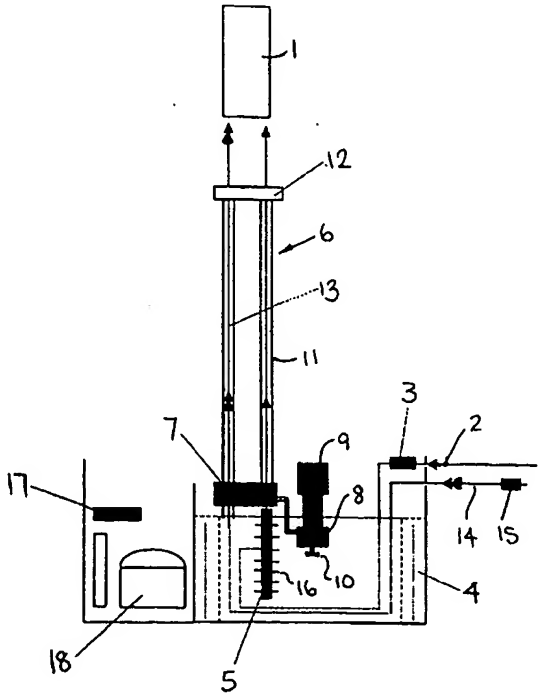

FIGURE 1

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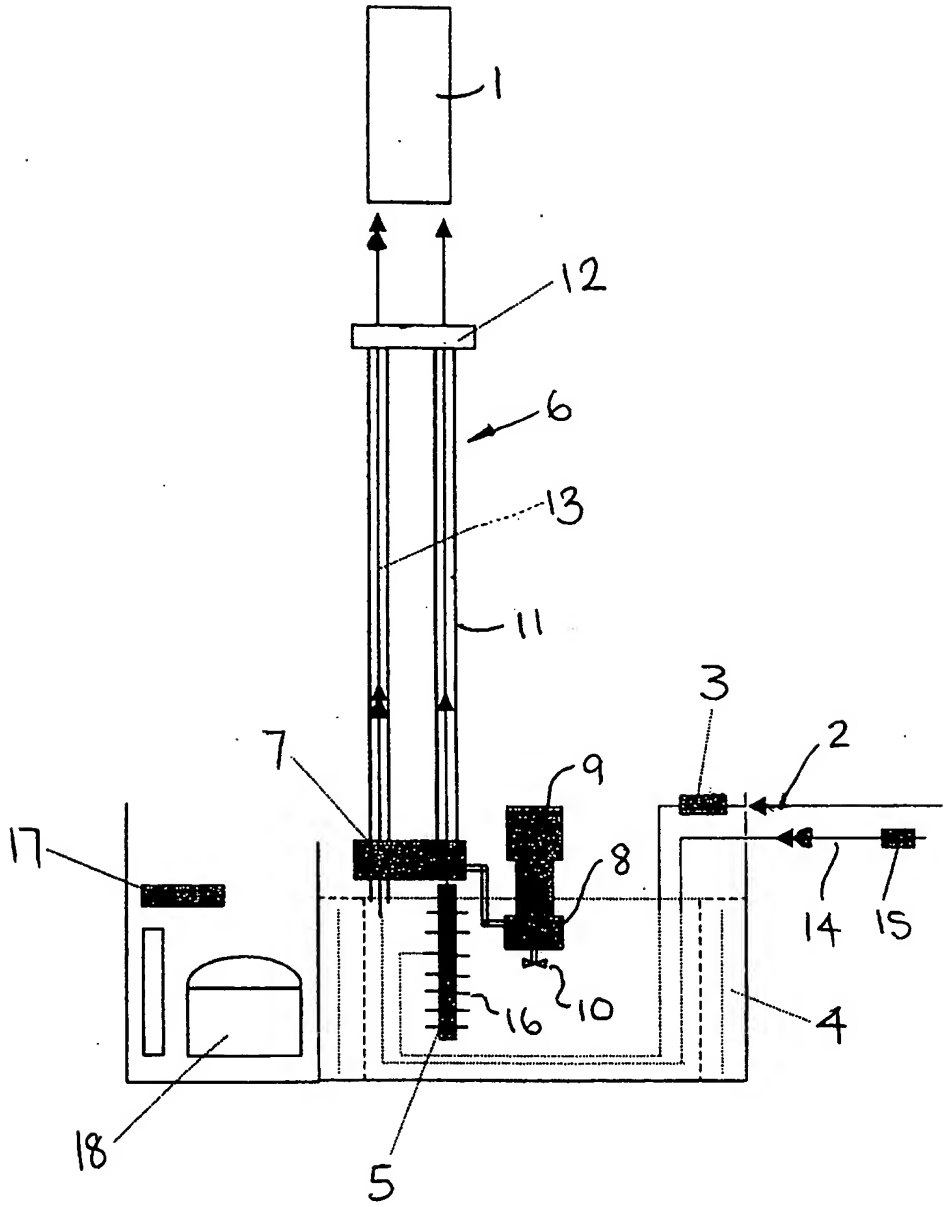

FIGURE 1

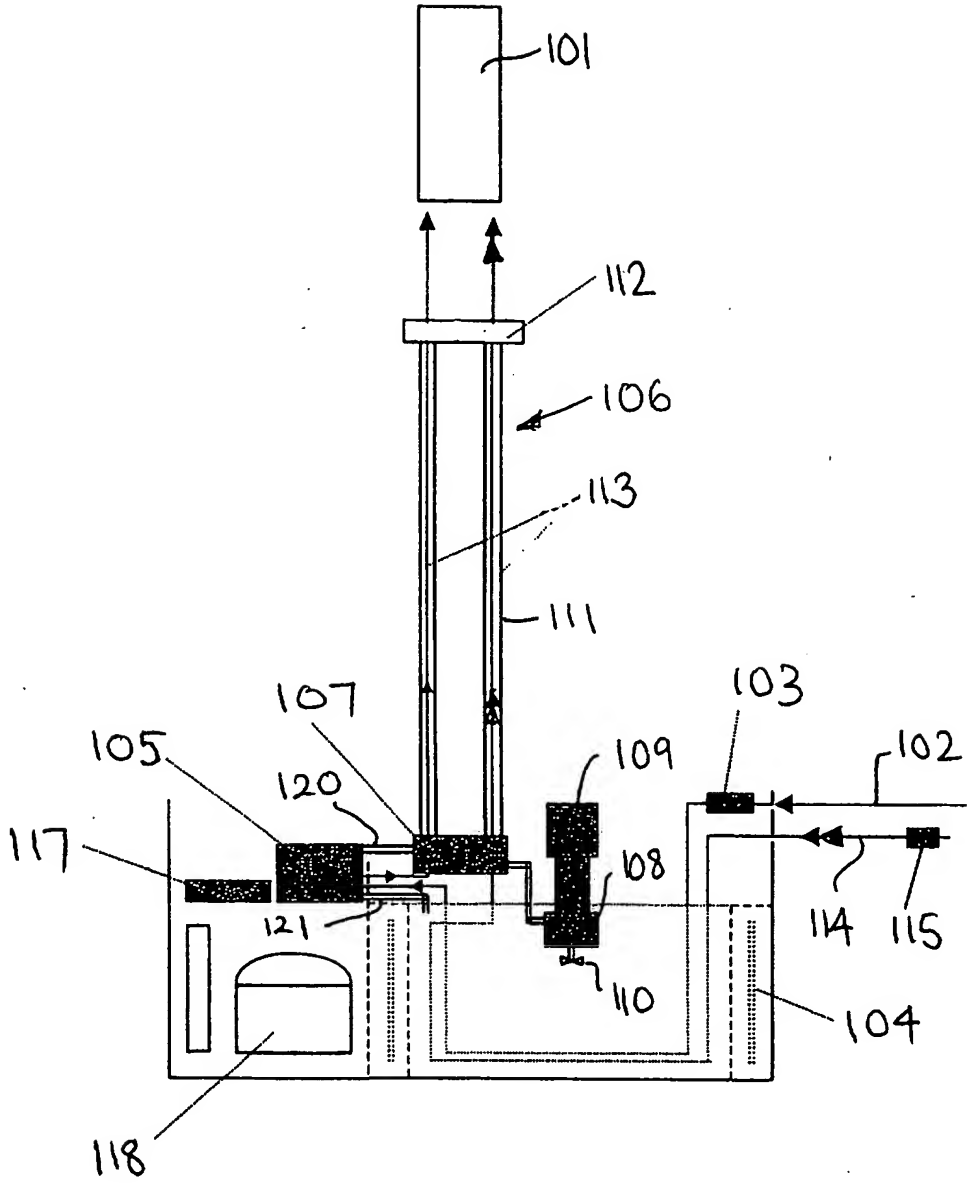
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FIGURE 2

BEVERAGE DISPENSE SYSTEM

This invention relates to a beverage dispense system and in particular to a beverage dispense system for a chilled beverage. It is especially suitable for dispensing beverages such as beers or lagers.

Conventional dispense systems for beers and lagers have an outlet typically a tap, at the point of sale that is connected to a remote source of the beer/lager, usually a barrel, stored at a separate location, normally a cellar room.

The beer/lager is chilled to a desired dispense temperature by passage through a cooler in the cellar room and pumped from the cellar room to the outlet within an insulated supply line that may contain separate pipes for several beverages together with pipes for re-circulating cooling water to maintain the beverage in each pipe at the dispense temperature. Such insulated supply lines are often referred to as a 'python'.

Conventional systems of this type are generally suitable for dispensing beverages at temperatures above 0°C. If it is desired to dispense a beverage at lower temperatures, there is a risk with such conventional systems that the beverage will freeze in the cooler and/or supply line preventing dispense of the beverage.

We have previously proposed in published UK Patent Application No.2358013-A a beverage dispense system capable of dispensing beverages such as beers/lagers at temperatures below 0°C. In this system, the beverage to be dispensed is cooled to a temperature just above 0°C in a first cooler and is passed through a second cooler operable during the dispense cycle to cool the beverage to the desired dispense temperature. The beverage is contained in a re-circulation loop

that passes through both coolers and includes the dispense tap. In this way, the beverage is prevented from freezing in the re-circulation loop between dispenses when the second cooler is inoperable.

Although this system has been found to work satisfactorily in practice, the provision of a re-circulation loop for the beverage adds to the complexity of the dispense system and increases installation costs.

The present invention seeks to provide a beverage dispense system wherein a chilled beverage can be dispensed at temperatures close to the freezing point of the beverage without employing a re-circulation loop for the beverage.

According to one aspect of the invention, there is provided a beverage dispense system including an outlet for dispensing a beverage, a remote source of beverage connected to the outlet by a supply line, a first cooler for cooling the beverage to a first temperature, and a second cooler for cooling the beverage further to a second temperature lower than the first temperature, and means for controlling dispense of beverage such that the beverage is cooled by the first and second coolers for part of the dispense and by one or neither coolers during a final part of the dispense whereby a static volume of beverage remaining in the supply line between the second cooler and the outlet between successive dispenses is at a temperature higher than the second temperature.

In a preferred arrangement, the first cooler is an ice bank cooler having a reservoir of water and the supply line passes through the reservoir for cooling the beverage to the first temperature, and the second cooler is a thermoelectric cooler having a hot side and a cold side generated by a voltage whereby the second cooler can be switched on and off to control further cooling of the beverage as desired.

The hot side of the thermoelectric cooler may be cooled by submerging the second cooler in the reservoir of the first cooler. Alternatively, the hot side may be cooled by contact with a re-circulation loop for water in the reservoir. The beverage supply line may be arranged in contact with the re-circulation loop downstream of the second cooler whereby the beverage is prevented from warming up appreciably on leaving the second cooler.

The system may include at least one outlet for directing a jet of chilled water onto the outside of a glass position below the beverage outlet. The water outlet may be connected to a water source, e.g. main water, in a supply line passing through the first cooler to chill the water. The water supply line may also be in contact with the re-circulation loop.

According to another aspect of the present invention, there is provided beverage dispense system comprising a first cooler for cooling a beverage to a first temperature, a second cooler for further cooling the beverage to a second temperature lower than the first temperature, the second cooler being a thermoelectric cooler whereby cooling of the beverage can be controlled during dispense by switching the second cooler off prior to completion of the dispense to prevent a static volume of beverage freezing in the supply line between successive dispenses.

According to yet another aspect of the present invention, there is provided a method of dispensing a beverage having a desired temperature comprising the steps of providing a source of beverage having a temperature higher than the desired temperature, cooling the beverage to a first temperature in a first cooler and further cooling the beverage to a second temperature in a second cooler, the second temperature corresponding substantially to the desired temperature, and controlling the

cooling of the first and/or second coolers whereby a static volume of beverage remaining in the system downstream of the second cooler on completion of a dispense is at a temperature higher than the desired temperature.

The invention will now be described in more detail by way of example only with reference to the accompanying drawings, wherein:-

Figure 1 is a schematic lay-out of a beverage dispense system according to a first embodiment of the invention; and

Figure 2 is a schematic lay-out of a beverage dispense system according to a second embodiment of the invention.

In the following description of exemplary embodiments of the invention, flow of the beverage to be dispensed is indicated by single headed arrows and flow of water to cool a beverage container is indicated by double headed arrows.

Referring now to Figure 1 of the drawings, a beverage dispense system is shown having a font 1 for dispensing a chilled beverage such as lager/beer into a container, typically a glass. The font 1 is positioned at a bar counter for operation by bar staff to dispense the beverage into the container.

In a typical arrangement, the font 1 has a dispense valve (not shown) that may be operable manually or electrically, for example by a tap or solenoid valve having an outlet through which the beverage is dispensed into a container placed below the outlet when the valve is open. Such means of dispense are well known and will not be further described as the details will be familiar to those skilled in the art.

The dispense valve is connected to a source of the beverage, for example a barrel, stored at a remote location such as a cellar room (not shown) by a supply line 2. The temperature of the cellar room may be controlled to maintain the beverage at a pre-determined temperature, for example 10°C.

The beverage is pumped from the barrel through the supply line 2 in response to actuation of a dispense at the outlet 1. The supply line includes a metering turbine 3 for measuring the volume of beverage dispensed.

The beverage is further cooled to a desired dispense temperature by passage of the supply line 2 through an ice bank cooler 4 and a thermoelectric cooler 5.

The ice bank cooler 4 cools the beverage from the temperature of the stored bulk beverage to a temperature just above 0°C, say 0.5°C and the thermoelectric cooler 5 provides additional cooling depending on the freezing temperature of the beverage.

For beer/lager, the additional cooling may reduce the temperature of the beverage by a further 4° or 5°C, i.e. down to minus 3.5°C-4.5°C without the beverage freezing.

The chilled beverage is delivered to the font 1 from the thermoelectric cooler 5 in the supply line 2. For most of the distance between the thermoelectric cooler 5 and the font 1, the supply line 2 forms the inner tube of a tube in tube re-circulation loop 6.

The re-circulation loop 6 includes a manifold 7 connected to a pump 8 operable by a motor 9 to pump chilled water from the ice bank cooler 4 to the manifold 7. The motor 9 also operates an agitator 10, for example a paddle, to circulate the water in the ice bank cooler 4

From the manifold 7 the water flows in a tube 11 surrounding the supply line 2 to a second manifold 12 located close to the font 1. The water flows in a tube 13 from the manifold 12 back to the manifold 7 from where it is returned to the ice bank cooler 4.

The water in the ice bank cooler 4 is at a low temperature, say 0.5°C, and the re-circulation system 6 prevents the chilled beverage flowing from the thermoelectric cooler 5 warming up to any appreciable extent before reaching the font 1.

In this embodiment, the font 1 is also provided with a supply of chilled water in a supply line 14 connected to the mains water supply. The supply line 14 passes through the ice bank cooler 4 and through the tube 13 of the re-circulation loop 6 so that the water is cooled to a low temperature, say 0.5°C, just above freezing. The font 1 is provided with one or more outlets (not shown) positioned to direct a jet of cold water from the supply line 14 onto the outside of the beverage container while rotating the beverage container.

The flow of water in supply line 14 is controlled by a solenoid valve 15 and is typically actuated to cool the beverage container before the beverage is dispensed. A system for cooling the container in this way forms the subject matter of our co-pending UK Patent Application No.2359065-A.

In this embodiment the thermoelectric cooler 5 comprises a Peltier plate assembly generating a hot side and a cold side by connection to a voltage supply (not shown). The beverage supply line 2 passes across the cold side to cool the beverage and the heat generated is taken away by immersing the cooler 5 in the ice bank cooler 4 to contact the hot side with the water in the ice bank cooler 4.

In this embodiment, the hot side is provided with fins 16 to increase the surface area in contact with the water in the ice bank cooler 4 to enhance the cooling effect. The thermoelectric cooler 5 is made watertight to prevent ingress of water and/or escape of water and the electrical connections to the cooler 5 are completely insulated to prevent risk of electrocution.

Positioning the thermoelectric cooler 5 in the reservoir of the ice bank cooler 4 reduces the space required to install the coolers 4,5 and provides a particularly efficient method of removing the heat generated by the thermoelectric cooler 5.

In operation of the system, actuation of a dispense at the font 1 causes the solenoid valve 15 to open and deliver chilled water in supply line 14 to the font 1 for spraying onto the outside of a glass or other suitable container positioned below the beverage outlet. Typically, the glass is supported on a drip tray (not shown) arranged to rotate the glass and collect the water.

Means (not shown) may be provided to detect the presence of the glass and over-ride the solenoid valve 15 to cut-off the water supply if the dispense is actuated without a glass being present and/or if the glass is incorrectly positioned and/or if the glass is removed before the dispense is completed.

At the same time or after a short delay after the solenoid valve 15 is opened, the dispense valve is opened and beverage is pumped in supply line 2 to the font 1 and delivered to the glass. The beverage is cooled in two stages, first by the ice bank cooler 4 and then by thermoelectric cooler 5, to reduce the temperature of the beverage from the temperature at which the bulk beverage is stored in the cellar room to the desired dispense temperature.

The flow measuring turbine 3 monitors the dispense and the thermoelectric cooler 5 is switched-off before the full volume of beverage to be dispensed is delivered to the font 1. For example, the volume of beverage in the supply line 2 between the thermoelectric cooler 5 and the font 1 may be relatively small compared to the total volume dispensed, and the thermoelectric cooler 5 may be switched off when this volume of beverage remains to be dispensed.

In this way, when the thermoelectric cooler 5 is switched off, the dispense is completed with beverage that has already been cooled to the dispense temperature by the ice bank cooler 4 and thermoelectric cooler 5, and the supply line 2 between the thermoelectric cooler 5 and font is filled with beverage that has been cooled by the ice bank cooler 4 only when the dispense valve closes at the end of the dispense.

As a result, the temperature of the static volume of beverage remaining in the supply line 2 between the thermoelectric cooler 5 and the font 1 is above the dispense temperature. Consequently, the risk of the beverage freezing in the supply line 2 between the thermoelectric cooler 5 and the font 1 is avoided in a simple manner without the need to re-circulate the beverage as described in our UK Patent Application No. 2 358 013-A.

The volume of beverage remaining in the supply line 2 between the thermoelectric cooler 5 and the font 1 is dispensed during the next dispense. However, the volume is relatively small (typically about 45 ml) and has a negligible effect on the final temperature of the beverage dispensed into the glass for both half-pint and pint dispenses. This volume is significantly lower than the volume of beverage contained in a re-circulation loop (typically about one and a half pints).

Alternatively or additionally, it may be possible to compensate for the initial dispense of beverage at a temperature above the desired dispense temperature by arranging the thermoelectric cooler 5 to cool the beverage to a temperature slightly below the desired dispense temperature so that, when added to the beverage at a slightly higher temperature, the resulting mixture has the desired dispense temperature.

Any suitable control system indicated generally by reference numeral 17 may be employed to control the dispense cycle, for example a programmable microprocessor. The microprocessor may be pre-programmed to open/close the solenoid valve 15 and the dispense valve in pre-determined sequence when a dispense is actuated and to control cooling of the beverage by the thermoelectric cooler 5 during the dispense.

For example, the microprocessor may open the solenoid valve 15 when the dispense is actuated to cool the glass by spraying with chilled water. At the same time, the thermoelectric cooler 5 is switched on in response to actuation of the dispense and the microprocessor opens the dispense valve in response to a signal from a temperature sensor such as a thermistor arranged to monitor the thermoelectric cooler 5.

The metering turbine 3 monitors flow of the beverage through the supply line 2 when the dispense valve is opened and the microprocessor is responsive to signals from the metering turbine 3 to control the dispense. Thus, the thermoelectric cooler 5 is switched off when a pre-determined volume of beverage slightly less than a selected metered volume (typically a half pint or pint) has been dispensed, and the dispense valve is closed when the metered volume has been dispensed.

The microprocessor may also control operation of a refrigeration system indicated generally be reference numeral 18 for controlling the ice bank cooler 4 to maintain a desired cooling load.

Referring now to Figure 2, a second embodiment of a beverage dispense system according to the present invention is shown. For convenience, like reference numerals in the series 100 are used to indicate parts corresponding to the first embodiment.

In this embodiment, the thermoelectric cooler 105 is not immersed in the ice bank cooler 104. Instead, the thermoelectric cooler 105 is positioned nearby and the re-circulation loop 106 is arranged to pass across the hot side to remove heat generated by the thermoelectric cooler 105. For this, the thermoelectric cooler 105 is connected by an inlet pipe 120 to the manifold 107 and has an outlet pipe 121 for returning water to the ice bank cooler 104.

The construction and operation of this embodiment is otherwise the same as the first embodiment and will be understood from the description of the first embodiment.

As will now be appreciated, the present invention provides a beverage dispense system for cooling a beverage to a low temperature for dispense

that avoids re-circulating the beverage to prevent it freezing in the supply line between dispenses. This is achieved by the simple expedient of controlling the cooling so that a volume of beverage at a temperature slightly higher than the desired dispense temperature is retained in the supply line when the dispense is completed. In this way, the dispense system is simplified with potential cost savings for installation. In addition, further potential cost savings may arise in use of the dispense reliability from improved reliability and easier maintenance.

It will be understood that the invention is not limited to the embodiments described and that various modifications and improvements can be made within the overall concept of the invention.

For example, the beverage supply line may include a by-pass for one or both coolers such that, during the final part of the dispense, the beverage passes through one or neither of the coolers so as to provide beverage at a temperature sufficient to prevent freezing in the supply line. The thermoelectric cooler may be replaced by any other cooler capable of reducing the temperature of the beverage sufficiently for dispense of chilled beverage having a desired temperature, for example a glycol heat exchanger.

Furthermore, while the invention has been described in a system where the glass is cooled by one or more jets of water prior to and/or during dispense of the beverage, it will be understood this may not be essential for all beverages and that the water cooling of the glass may be omitted.

CLAIMS

1. A beverage dispense system including an outlet for dispensing a beverage, a remote source of beverage connected to the outlet by a supply line, a first cooler for cooling the beverage to a first temperature, and a second cooler for cooling the beverage further to a second temperature lower than the first temperature, and means for controlling dispense of beverage such that the beverage is cooled by the first and second coolers for part of the dispense and by one or neither coolers during a final part of the dispense whereby a static volume of beverage remaining in the supply line between the second cooler and the outlet between successive dispenses is at a temperature higher than the second temperature.

2. A beverage dispense system according to claim 1 wherein the first cooler is an ice bank cooler having a reservoir of water and the supply line passes through the reservoir for cooling the beverage to the first temperature.

3. A beverage dispense system according to claim 1 or claim 2 wherein the second cooler is a thermoelectric cooler having a hot side and a cold side generated by a voltage whereby the second cooler can be switched on and off to control further cooling of the beverage as desired.

4. A beverage dispense system according to claim 3 as dependent on claim 2 wherein the hot side of the thermoelectric cooler is cooled by submerging the second cooler in the reservoir of the first cooler.

5. A beverage dispense system according to any one of claims 1 to 4 wherein the beverage supply line is arranged in contact with a re-circulation loop for water in the reservoir downstream of the second cooler.

6. A beverage dispense system according to claim 3 as dependent on claim 2 wherein the hot side of the thermoelectric cooler is cooled by contact with a re-circulation loop for water in the reservoir.

7. A beverage dispense system according to claim 6 wherein the beverage supply line is arranged in contact with the re-circulation loop downstream of the thermoelectric cooler.

8. A beverage dispense system according to any one of the preceding claims wherein at least one outlet is provided for directing a jet of chilled water onto the outside of a glass positioned below the beverage outlet.

9. A beverage dispense system according to claim 8 wherein the water outlet is connected to a water source in a supply line passing through the first cooler to chill the water.

10. A beverage dispense system according to claim 9 as dependent on claim 5 or claim 6 wherein the water supply line is in contact with the re-circulation loop.

11. A beverage dispense system according to any one of the preceding claims wherein the control means is operable to switch the second cooler off during the final part of the dispense.

12. A beverage dispense system according to any one of the preceding claims wherein the control means includes a programmable microprocessor.

13. A beverage dispense system according to any one of the preceding claims wherein the second cooler is operable to cool the beverage to a temperature slightly lower than the desired dispense temperature.

14. A beverage dispense system comprising a first cooler for cooling a beverage to a first temperature, a second cooler for further cooling the beverage to a second temperature lower than the first temperature, the second cooler being a thermoelectric cooler whereby cooling of the beverage can be controlled during dispense by switching the second cooler off prior to completion of the dispense to prevent a static volume of beverage freezing in the supply line between successive dispenses.

15. A beverage dispense system according to claim 14 wherein the second temperature corresponds substantially to a desired dispense temperature and the static volume of beverage remaining in the supply line downstream of the second cooler on completion of the dispense is at a temperature higher than the desired dispense temperature.

16. A beverage dispense system according to claim 14 or claim 15 wherein the first cooler is an ice bank cooler and the second cooler is a thermoelectric cooler.

17. A method of dispensing a beverage having a desired temperature comprising the steps of providing a source of beverage having a temperature higher than the desired temperature, cooling the beverage to a first temperature in a first cooler and further cooling the beverage to a second temperature in a second cooler, the second temperature corresponding substantially to the desired temperature, and controlling the cooling of the first and/or second coolers whereby a static volume of beverage remaining in the system downstream of the second cooler on

completion of a dispense is at a temperature higher than the desired temperature.

18. A method according to claim 17 wherein the second cooler is switched off before completion of the dispense.

19. A beverage dispense system substantially as hereinbefore described with reference to Figure 1 of the accompanying drawings.

20. A beverage dispense system substantially as hereinbefore described with reference to Figure 1 of the accompanying drawings as modified by Figure 2 of the accompanying drawings.

21. A method of dispensing a beverage having a desired temperature substantially as hereinbefore described with reference to Figure 1 of the accompanying drawings.

22. A method of dispensing a beverage having a desired temperature substantially as hereinbefore described with reference to Figure 1 of the accompanying drawings as modified by Figure 2 of the accompanying drawings.

23. A beverage dispensed by the apparatus or method according to any one of the preceding claims.

24. A dispensed beverage according to claim 23 having a temperature of minus 3.5°C-4.5°C.

25. A dispensed beverage according to claim 23 or claim 24 comprising beer or lager.

Application No: GB 0130835.2 16 **Examiner:** J. C. Barnes-Paddock
Claims searched: 1-25 **Date of search:** 31 January 2003

Patents Act 1977 : Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance	
X	17,23	GB2338544 A	(IMI CORNELIUS) See Figure 1 and page 6, lines 16-20. First and thermoelectric second coolers with anti-freezing temperature control.
A		GB2363777 A	(IMI CORNELIUS) See Figure 1. Recirculation arrangement with second heat exchanger controlling non-dispensed temperature.
A		GB2208918 A	(IMI CORNELIUS) See Figure 1. Beverage cooled immediately prior to dispense.

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC[V]:

B8N F4H

Worldwide search of patent documents classified in the following areas of the IPC[7]:

B67D F25D

The following online and other databases have been used in the preparation of this search report:

Online: WPI, EPODOC, PAJ, TXTUS0, TXTUS1, TXTUS2, TXTUS3, TXTEP1, TXTGB1, TXTWO1